

Remarks

By this Amendment, claims 16, 17, 18, 19, and 21 have been amended. After entry of this Amendment, claims 1-5, 7-21, and 75-107 are pending in the present application.

Reconsideration in view of the following amendments and remarks is requested.

I. Interview Summary

Applicants' attorney telephoned Examiner Dougherty on August 29, 2003, to determine whether the Information Disclosure Statement and the corresponding Form 1449 filed on May 30, 2003, had been considered by the Examiner. Examiner Dougherty confirmed that the Form 1449 had been made of record and would be acted on in a timely manner. Examiner Dougherty also stated that he would soon examine the corresponding PCT application.

In a telephone interview on October 31, 2003, between Applicants' attorney and Examiner Dougherty, Applicants' attorney noted that claims 75-94 were not addressed in the Office action dated September 17, 2003. Examiner Dougherty stated that he would send another Office action to address this oversight. The substance of this interview is further discussed in the remarks below.

II. Allowable Subject Matter

Applicants thank the Examiner for indicating that claims 75-103 are allowed and that claim 18 is objected to but would be allowable if re-written in independent form.

III. 35 U.S.C. § 102(b) Rejection of Claims 1, 2, 4, 7, and 16

Claims 1, 2, 4, 7, and 16 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by PCT Publication No. WO 94/18433 to Ohio University (the “Ohio reference”). Applicants traverse this rejection and request that it be withdrawn.

Claims 1, 2, 4, and 7:

Claim 1 is directed to a micro-transducer comprising a first membrane, a second membrane comprising a first electrode, a second electrode, and a piezoelectric member disposed therebetween. The micro-transducer also comprises a fluid-tight cavity cooperatively formed between the first and second membranes and a working fluid disposed in the cavity, wherein the working fluid is a saturated mixture of vapor and liquid (i.e., the working fluid is a two-phase working fluid). The Ohio reference neither teaches nor suggests this combination of features as set forth in claim 1.

The Ohio reference is understood to disclose a miniature Stirling cycle engine comprising a pressure-containing vessel formed between an uppermost silicon substrate 14 and a lowermost silicon substrate 22. The pressure-containing vessel contains a working fluid, which is typically a gas. Page 8, lines 14-22 and FIG. 5. However, the Ohio reference fails to provide any disclosure or suggestion of using a two-phase working fluid, as recited in claim 1.

As discussed in Applicants’ specification, the use of a two-phase working fluid is significant in that it increases the thermal efficiency of the micro-transducer. See page 8, lines 9-10 of the present application. Further, the use of a two-phase working fluid in a transducer is against conventional wisdom because a two-phase working fluid can destroy conventional large-scale heat engines and heat pumps. See page 8, lines 10-18 of the present application. The only

suggestion to use a two-phase working fluid has come from Applicants' specification, which cannot be use in hindsight.

For the foregoing reasons, claim 1 is not anticipated or rendered obvious by the Ohio reference and is allowable.

Claims 2, 4, and 7 depend from claim 1 and are allowable for the reasons given above in support of claim 1 and further because each dependent claim sets forth an independently patentable combination of features.

Claim 16:

Claim 16 has been amended to include the features previously recited in claim 17, which was not rejected for anticipation by the Ohio reference. Thus, Applicants request that the rejection of claim 16 be withdrawn.

IV. 35 U.S.C. § 102(b) Rejection of Claims 1 and 16

Claims 1 and 16 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 4,140,936 to Bullock (Bullock). Applicants traverse this rejection and request that it be withdrawn.

Claim 1 is patentable over Bullock because Bullock neither teaches nor suggests a micro-transducer containing a working fluid comprising a saturated mixture of vapor and liquid, as recited in claim 1. At best, Bullock discloses a transducer element having fluid-filled cavities 16, 19 (FIG. 6). However, there is nothing in Bullock that teaches or suggests using a saturated mixture of vapor and liquid as a working fluid. Hence, Bullock does not teach or suggest the combination of features recited in claim 1. Therefore, the rejection of claim 1 should be withdrawn.

Claim 16 has been amended to include the features previously recited in claim 17, which was not rejected for anticipation by Bullock. Thus, Applicants request that the rejection as to claim 16 be withdrawn.

V. 35 U.S.C. § 102(b) Rejection of Claims 1-17 and 19-21

Claims 1-17 and 19-21 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Xu et al., "Design of a Micro Heat Engine," MEMS-Vol. 2, Micro-Mechanical Systems (MEMS), Nov. 2000, pp. 261-267.

As discussed in the October 31, 2003 interview, the priority date of the present application is October 25, 2000. The Xu reference was published in November 2000, and therefore is not prior art under 35 U.S.C. § 102(b). Thus, Applicants request that this rejection be withdrawn.

VI. Claims 104-107

Claims 104-107 are not addressed in the detailed portion of the action. On January 27, 2004, Applicants' attorney left a voice mail message for Examiner Dougherty to discuss the rejection of these claims. In a voice mail message left for Applicants' attorney on January 30, 2004, Examiner Dougherty indicated that the present Amendment would be responsive to the rejection of claims 104-107 if the Amendment pointed out that these claims were not addressed in the action.

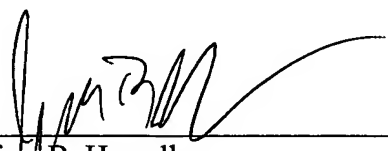
Applicants respectfully request the Examiner to indicate that these claims are allowable or address the rejection of these claims in a non-final action.

VII. Conclusion

The present application is in condition for allowance and such action is respectfully requested. If any further issues remain concerning this application, the Examiner is requested to call the undersigned to discuss such matters.

Respectfully submitted,

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FIG. 4

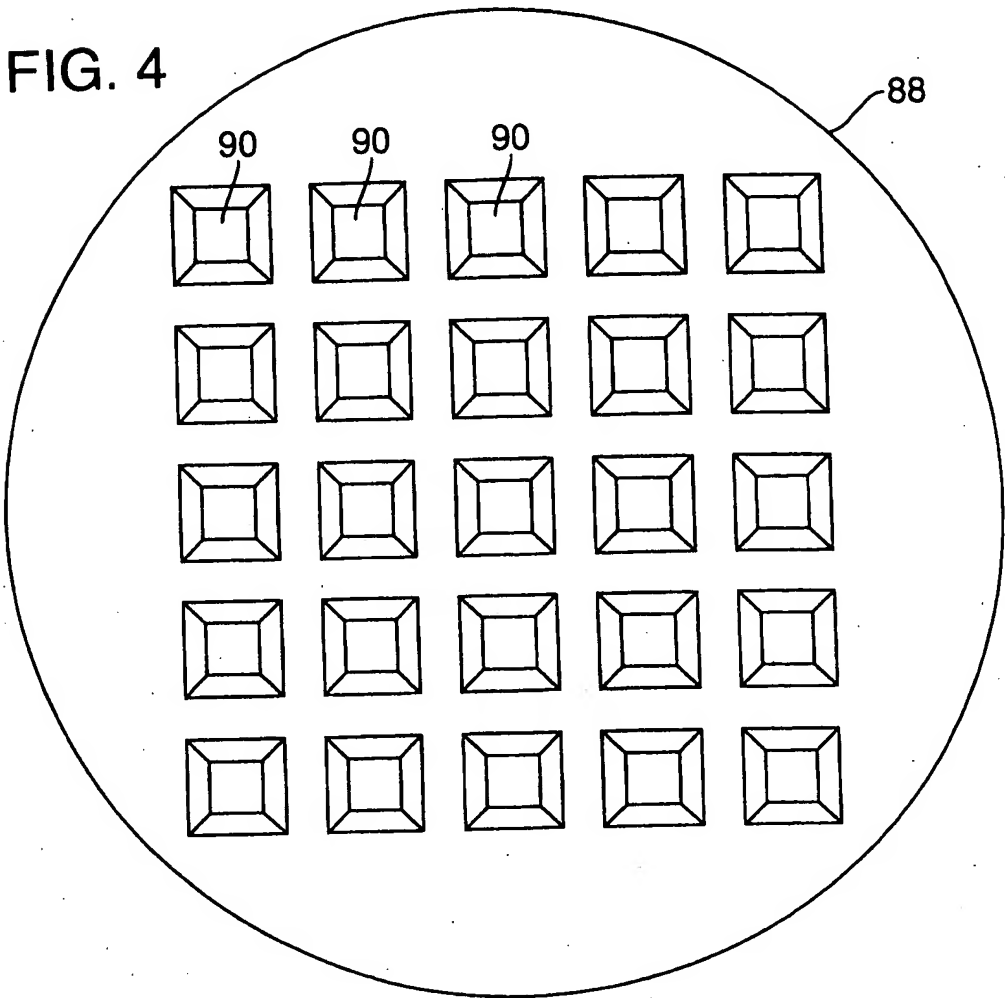


FIG. 5

